OP-80A

OWNER'S MANUAL

OAE

TABLE OF CONTENTS

PARTS LIST

OP-80A-IC1-IC9	NE555*	$ 1.50 ea.
-IC10	SN7474	.95
-IC11	SN7437	.95
-C1, C2	.1mf 10v disc capacitors	.35
-R1	25-50K In-line Resistor* Array	2.75
-R2-R5	220 ohm, $^1/_4$ watt	.20
-I1-I4	Red LED*	1.25
-S1	Precision Sensor Array*	32.00
-WW1	16 Pin Wire Wrap Socket	1.25
-WG1	1.647" Precision Wire Guide	.45
-WG2	1.000" Precision Wire Guide	.45
-24"	Fine Solder	.35
-PC1	OP-80A Printed Circuit Card	12.00
-IM	OP-80A Instruction Manual	3.50
-B1	Anodized Extruded Aluminum Box	7.50
-DIP48	DIP Connector w/48" Cable	5.00

Include $2.50 for shipping/handling within the continental U.S.

*
These items are selected and matched devices.

Do not order seperately.

Operation of the OP-8 0A Paper Tape Reader is straight forward. The paper tape to be read is inserted between the guides and pulled from left to right. Note the position of the OAE arrow " > " and the small sprocket arrow pointing to the fourth sensor from the bottom for proper tape orientation.

In order to read light weight paper tape (semi-opaque), an LED indicator has been provided to facilitate proper align- ment of the light source. (Note...A great deal of feedback is utilized in the sensor design to reject the 60 cycle AC component emitted by the light source, however, fluorescent light is not recommended as a source.) To align the reader, place a low wattage incandescent lamp (15 to 60 watts recom- mended) over the reader and lower until the SP (Sprocket) LED comes on. The OP-80A is now ready for use.

To test the reader, toggle a simple bootstrap loader program into the computer.[2] The program should run in a loop waiting for the RDA line to go high (or $\overline{\text{RDA}}$ to go low.) When the line goes high, the data should be input through the port. If an acknowledge signal is generated by the data input port, it should be sent out over ACK (or $\overline{\text{ACK}}$). If no acknowledge signal is available, the program must generate one. This may be output through the same port that supplies data to S1 and S2. The program will now return to

the initial loop and wait for the next RDA change.

[1]A high intensity lamp with a 12v auto lamp is an excellent
light source. ie., Tensor Model 6500 with bulb #1156.

[2]Refer to OP-80A SUPPORT SOFTWARE later in this manual.

**THE OP-80A MAY BE CONNECTED TO ANY MICROPROCESSOR SYSTEM WITH A PARALLEL INTERFACE.**

DATA DO-D7 (⎍)

DIGITAL SYSTEM

READER DATA AVAILABLE (⎍ or ⎍)

ACKNOWLEDGE   (⎍ or ⎍)

+5 vdc (175 ma MAX)

GROUND

ALL LINES ARE TTL COMPATIBLE!
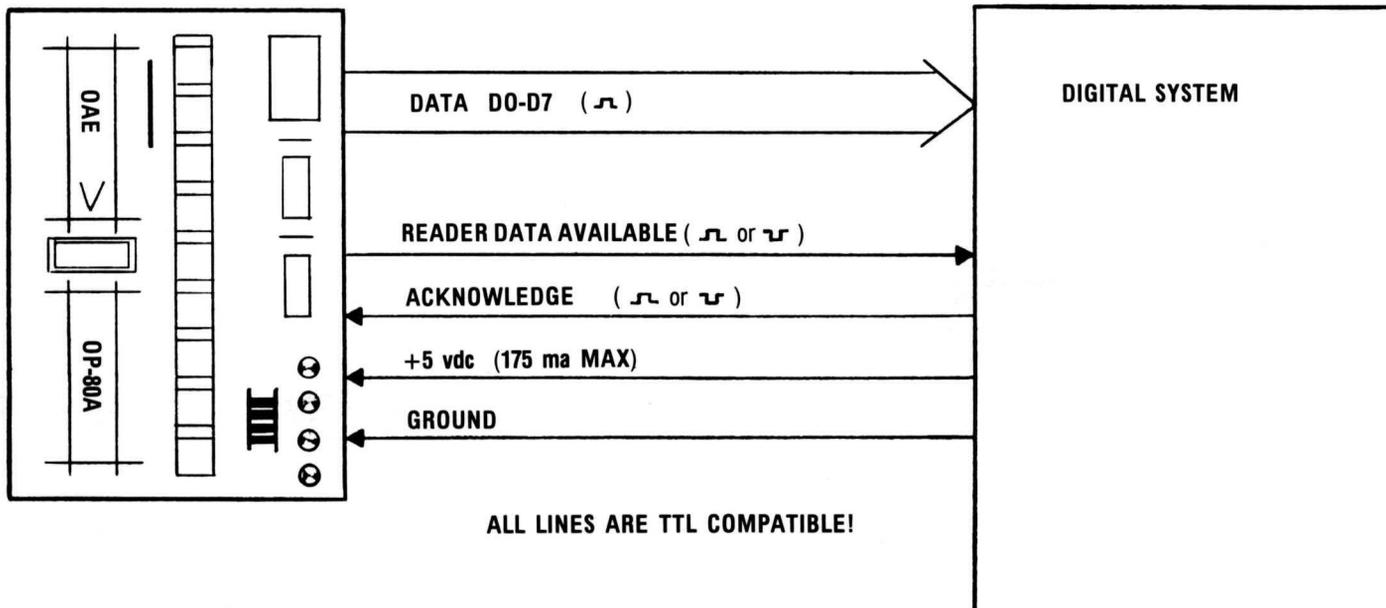
I.   INSTALL WIRE GUIDES, SENSOR ARRAY

    A. Mount the long horizontal guides 5/32" above the card. A drill makes an excellent stand-off for this operation. The horizontal guides must be mounted first!

    B. Install the short vertical guides. Use 4 to 6 layers of paper tape between the horizontal and vertical guides for proper spacing.

    C. Drop the sensor on to the card. Watch the placement of pin 1. Thread some paper tape on to the reader. Solder pin 1. With the tape pulled taut, reheat pin 1 and align the sensor as shown below.

All chips should be dead center.

Paper tape data hole.
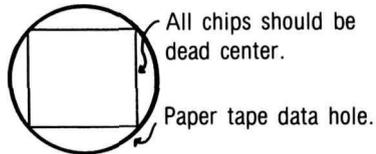
    D. Solder all sensor leads. If the paper tape is still not properly centered over the sensor array, adjust the guides with a small pair of pliers.

II.   MOUNT THE FOLLOWING PARTS IN THE ORDER LISTED

        CAUTION...Almost all components used in this kit
        are polarity sensitive.   Use care when installing
        the components and refer to the parts placement
        diagram.

    A.   Mount all the resistors.   Refer to the parts
         placement diagram.   Watch the placement of
         Pin 1 when mounting Rl.

    B.   Install Jl.

    C.   If you plan to mount the optional light source,
         (OP-80A-L1), install J2.

    D.   If your data input port generates a negative
         going data acknowledge signal ($\overline{ACK}$), jumper
         point A to $\overline{ACK}$.   If the acknowledge signal is
         positive going, jump A to ACK.

    E.   Mount all ICs.   Watch the placement of Pin 1.

    F.   Mount the wire wrap socket.   Do not cut the
         pins.   They may be needed if additional option
         cards are purchased.

    G.   Mount all the LEDs.   Watch the placement of the
         cathode lead.   (The LED chip is mounted to the
         cathode lead.)

    H.   Mount the disc capacitors.

I.   This completes the assembly of the printed
     Circuit card.   INSPECT YOUR WORK CAREFULLY!
     It is suggested you proceed to the cable
     assembly and interface instructions before
     assembling the box.

Connect the reader to a 5v power source and apply
power. (Note; The OP-80A runs cool - if any compon-
ents heat up when power is applied, remove power immedi-
ately and recheck your work).

Place the reader under a light source. The SP LED
should come on. (The power led is always on, S1 and S2
will be on if left unconnected.) All data lines should
be high **($\cong$3.5v).**

Pass your hand over the sensor array. Data lines
D0 through D7 should go off **($\cong$.04v)** one by one.

If any of the data lines fail to respond, recheck
and solder the appropriate components.

Thousands of OP-80A's have been sold with a warranty
repair rate of less than 2%. However, if you have a
problem with your reader, send the unit (less the box)
with a description of the problem and a check for the
return shipping and handling -($2.50 Ground,$3.50 Air
within continental United States) to:

> OLIVER AUDIO ENGINEERING, INC.
>
> 7330 LAUREL CANYON BLVD.
>
> NORTH HOLLYWOOD, CALIF. 91605

We will be happy to repair and return your unit
as soon as possible.

Refer to the I/O SOCKET diagram in this manual. Using the diagram, connect the reader to a parallel port in the computer. If you wish to connect the reader to a port with a serial interface already installed, refer to the OP-80A UART INTERFACE BULLETIN.

The parallel interface is very straight forward. The data lines D0 thru D7 are connected to the input port. When data is available, RDA goes HIGH AND $\overline{RDA}$ goes LOW. Either signal may be used to flag the computer through a second input port. After the computer has input the data, it should reset the RDA latch. This may be done with a positive or negative PULSE (ACK OR $\overline{ACK}$) from a computer output port. This same output port may also control the buffered status LEDS, S1 and S2.

If you do not want to use an output port to reset the RDA latch, you may obtain an ACK (or $\overline{ACK}$) signal from the computer input port. This signal is usually the product of a CPU generated "IN" signal, the decoded port address, and a clock timing signal. Refer to your microprocessor manual for details.

OP-80A I/O SOCKET

D0	1	● BRN	RED ●	16	Dl
D2	2	● ORG	YEL ●	15	D3
D4	3	● GRN	BLU ●	14	D5
D6	4	● VIO	GRY ●	13	D7
ACK or ACK	5	● WHT	BLK ●	12	SPARE
RDA	6	● BRN	RED ●	11	S2
RDA	7	● ORG	YEL ●	10	S1
GROUND	8	● GRN	BLU ●	9	+5vdc

D0 thru D7	DATA OUTPUT BYTE
S1 and S2	STATUS LEDS
RDA	READER DATA AVAILABLE
$\overline{RDA}$	READER DATA AVAILABLE
ACK or $\overline{ACK}$	ACKNOWLEDGE (resets RDA and $\overline{RDA}$)
POWER	+5vdc @ 175ma MAXIMUM

OP-80A UART INTERFACE BULLETIN

By using the circuit shown below, the OP-80A can
be connected directly to the terminal I/O (Input/Output)
port in your computer - thus allowing you to load paper
tapes at high speed without software modifications.

Advantages: Software may be loaded with the OP-80A using
the existing terminal software routines. This
may be helpfull if your I/O routines are in ROM.

Disadvantages: Requires hardware modifications of the serial
interface card.
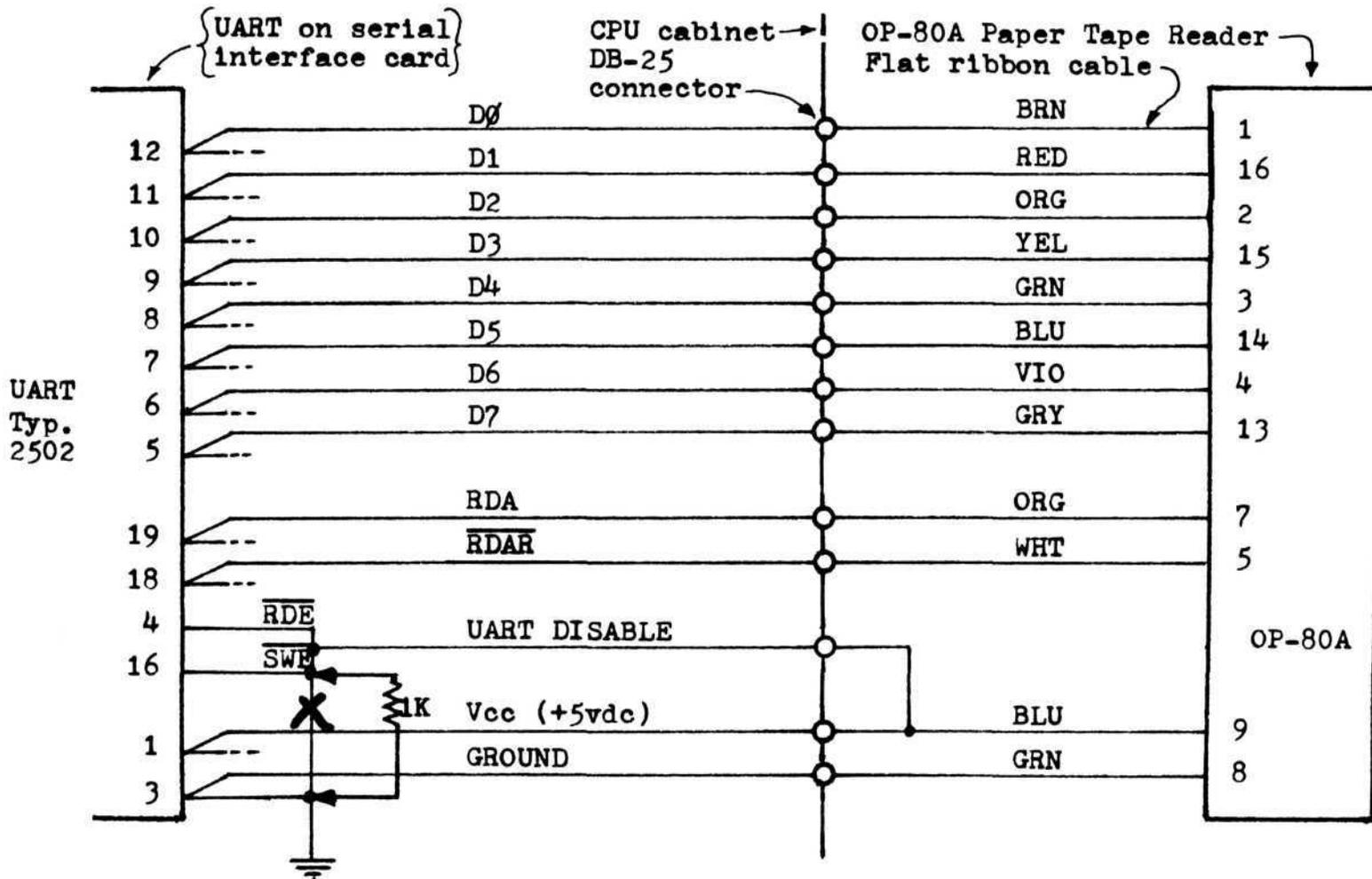
I/O SOCKET
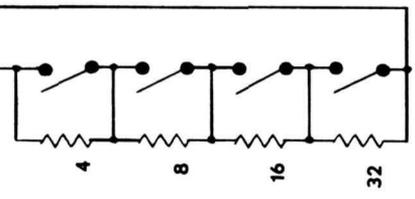
OP-80A
PAPER TAPE READER

1. R1 & S1 are matched for sensi-
tivity.
2. The led marked "power" is
used as a voltage reference. Do
not substitute for the LEDs
supplied.
3. IC's 1 thru 9 are matched for
sensitivity. Do not substitute.

OPTIONAL LAMP KIT

-11-

OLIVER AUDIO ENGINEERING, INC.   NORTH HOLLYWOOD, CALIFORNIA

12-1-76
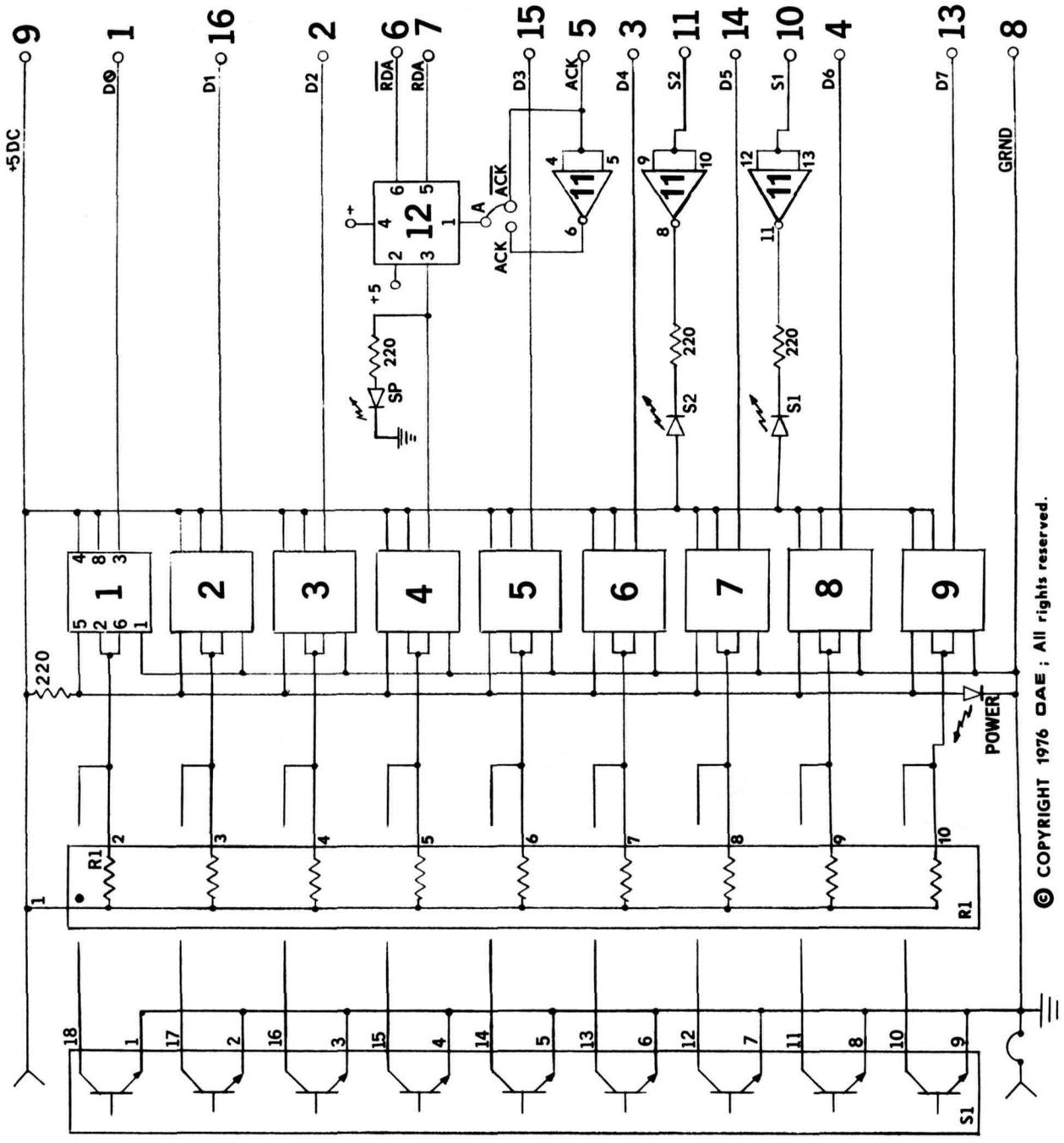
After connecting the reader to your computer,
toggle in the "8080 BINARY LOADER" (or its equivalent
if you are using a different processor) and single
step through the program to test your interface.

If you encounter difficulty when interfacing the
reader, use a logic probe to follow the data and hand-
shake signals as they proceed through the parallel
interface circuitry. If a logic probe is not available,
STATUS LEDS S1 and S2 may be used. Note that you will
not be able to see fast, low repetition pulses; the
same applies to a scope.

```
FILE
BINRY  3000   35F6

ASSM 0000 2000
0000                    0010 *  DATE:   12-01-76      OLIVER AUDIO ENGINEERING
0000                    0020 *  TIME:   1400 HRS       NORTH HOLLYWOOD,  CALIF.
0000                    0030 *
0000                    0040 ********** 8080 BINARY PAPER TAPE LOADER  **********
0000                    0050 *
0000                    0060 *  THIS LOADER PLACES BINARY DATA FROM THE OP-80A
0000                    0070 *  IN MEMORY BEGINNING AT THE 'STARTING ADDRESS'.
0000                    0080 *  NOTE:   YOU MAY HAVE TO PATCH (MODIFY) THE INPUT
0000                    0090 *          PORT NUMBERS AND THE BIT MASK (NOW 80H)
0000                    0100 *          TO CORRESPOND TO YOUR HARDWARE CONNECTIONS.
0000                    0110 *
0000 21 00 00           0120            LXI   H,0000H     STARTING ADDRESS
0003 DB 00              0130 STBY       IN    0           INPUT READER STATUS BIT (RDA)
0005 E6 80              0140            ANI   80H         DROP (MASK) ALL BUT RDA STATUS BIT
0007 CA 03 00           0150            JZ    STBY        WAIT FOR FIRST DATA BYTE
000A DB 01              0160            IN    1           INPUT DATA BYTE
000C B7                 0170            ORA   A           SET ACCUM STATUS FLAGS
000D CA 03 00           0180            JZ    STBY        WAIT FOR FIRST NON-ZERO DATA BYTE
0010 77                 0190 STUFF      MOV   M,A         STORE DATA AT LOCATION HL
0011 23                 0200            INX   H           INCREMENT MEMORY POINTER
0012 DB 00              0210 WAIT       IN    0           INPUT READER STATUS BIT (RDA)
0014 E6 80              0220            ANI   80H         DROP ALL BUT STATUS BIT
0016 CA 12 00           0230            JZ    WAIT        WAIT FOR DATA
0019                    0240 ******************************************************
0019                    0250 *  THE FOLLOWING ROUTINE IS NOT REQUIRED IF THE
0019                    0260 *  INTERFACE GENERATES AN ACKNOWLEDGE SIGNAL.
0019 3E 80              0270            MVI   A,80H       SET ACKNOWLEDGE BIT HIGH
001B D3 02              0280            OUT   2           OUTPUT ACK SIGNAL
001D 2F                 0290            CMA
001E D3 02              0300            OUT   2           REMOVE ACK SIGNAL
0020                    0310 ******************************************************
0020 DB 01              0320            IN    1           INPUT READER DATA
0022 C3 10 00           0330            JMP   STUFF
```

```
2000                        0000 * DATE:    12-01-76
2000                        0010 * TIME:    1200 HRS
2000                        0020 *
2000                        0030 * THIS IS THE INTEL FORMAT PAPER TAPE LOADER.
2000                        0040 *    YOU MAY NEED TO PATCH THE STACK POINTER
2000                        0050 *    AND TTYIN LOCATIONS FOR YOUR SYSTEM.
2000                        0060 *
2000                        0070 *   INITIALIZE THE STACK POINTER
2000 31 00 4D               0080          LXI     SP 4D00H
2003 CD 06 20               0090          CALL    READ
2006                        0100 *   INPUT BLOCK LENGTH AND ADDRESS
2006 CD 45 20               0110 READ     CALL    TTYIN
2009 FE 3A                  0120          CPI
200B C2 06 20               0130          JNZ     READ
200E CD 2A 20               0140          CALL    CHAR
2011 57                     0150          MOV     D,A
2012 C8                     0160          RZ
2013 CD 2A 20               0170          CALL    CHAR
2016 67                     0180          MOV     H,A
2017 CD 2A 20               0190          CALL    CHAR
201A 6F                     0200          MOV     L,A
201B CD 2A 20               0210          CALL    CHAR
201E                        0220 *   INPUT BLOCK OF DATA
201E CD 2A 20               0230 LOOP     CALL    CHAR
2021 77                     0240          MOV     M,A
2022 23                     0250          INX     H
2023 15                     0260          DCR     D
2024 C2 1E 20               0270          JNZ     LOOP
2027 C3 06 20               0280          JMP     READ
202A                        0290 *   CONVERT ASCII TO BINARY
202A CD 45 20               0300 CHAR     CALL    TTYIN
202D CD 3D 20               0310          CALL    HEX
2030 07                     0320          RLC
2031 17                     0330          RAL
2032 17                     0340          RAL
2033 17                     0350          RAL
2034 5F                     0360          MOV     E,A
2035 CD 45 20               0370          CALL    TTYIN
2038 CD 3D 20               0380          CALL    HEX
203B 83                     0390          ADD     E
203C C9                     0400          RET
203D                        0410 *   CONVERT HEX (A-F) TO BINARY
203D D6 30                  0420 HEX      SUI     30H
203F FE 0A                  0430          CPI     0AH
2041 D8                     0440          RC
2042 D6 07                  0450          SUI     07H
2044 C9                     0460          RET
2045                        0470 *   INPUT HEX FORMATTED DATA FROM OP-80A
2045                        0480 *   AND ECHO TO TERMINAL.  (DELETE THE OUT COMMAND
2045                        0490 *   IF YOU WISH TO LOAD TAPE AT HIGH SPEED!)
2045 DB 00                  0500 TTYIN    IN      0
2047 E6 80                  0510          ANI     80H
2049 CA 45 20               0520          JZ      TTYIN
204C DB 01                  0530          IN      1
204E D3 01                  0540          OUT     1
2050 E6 7F                  0550          ANI     7FH
2052 C9                     0560          RET
```

DO NOT CUT GUIDES
ON I/O SOCKET!

I/O

IC 10 (74 74)

IC 11 (7437)

J1

R5

R4

R3

R2

A S1 S2 SP PWR

ACK

ACK

IC 9

IC 8

IC 7

IC 6

IC 5

IC 4

IC 3

IC 2

IC 1
(NE 555)

R1

MOUNT LONG
HORIZONTAL
GUIDES FIRST!

5/32" VERTICAL CLEARANCE

OP-80A

OAE >

10

18

+

OAE >

© 1976 **OAE**

3-1-76   REV 1